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**FBI Weapons of Mass Destruction Directorate  
Intelligence Analysis Section**

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**Subject:** This summary addresses the electronic components and related transactions that have been provided to review by the San Antonio, Texas FBI Field Office and the Department of Homeland Security Immigration and Customs Enforcement Special Agents and Analysts.

**Transaction Summary**

Inspection of the transaction lists indicates a large number of related items that are suitable for tactical RF (radio frequency) system development, missile and nuclear weapons development, electronic warfare, surveillance, and debugging applications. These items are suitable for building and troubleshooting specialized systems for military, law enforcement, space, research and commercial applications. Other items reviewed can easily serve as spares for existing systems the end users have. Focus of this review has been directed on some of the items that can be grouped into systems and some of the discrete items that can be supportive for other technical applications. The items ordered identify very specific part numbers ordered that go beyond random spares ordering. Given the diversity of part being sought, it is likely there are multiple end users for these parts requests with targeted systems applications.

In one major transaction grouping, there are many components being ordered from the ComBlock Corporation, which specializes in product development suitable for building modular complex RF communications equipment using Software Defined Radio (SDR) technology. While the ComBlock components form a core element of the end users design effort, many of the other components on the parts list are suitable for interconnecting parts, and providing input/output feeds from the core modules to other discrete components. By taking this design approach, engineers using these items could possibly circumvent export control restrictions related to SDR by custom designing the controlled items from these basic parts. However, this does not mean the discrete hardware and software items are not suitable for other dual use applications such as radar and missile development.

A second group of items on the black transaction list (ATDI's: HTZ warfare, ICS Telecom, ICS Manager, and Hertz Mapper) appears more related to probable management of the ComBlock modules use, and possibly other items not yet evaluated on the transaction lists, associated with pre-deployment and real-time analysis of military tactical communications.

A third group of items is the MPI Vibration Test System on the black transaction list. This item is of concern because it seems related to missile development and testing of payload hardware. Such validation testing is performed as part of the US Stockpile Surveillance Program and offers insight as to a possible end use. Additional information provided by DHS/ICE indicates there are two digitally controlled electromagnetic shaker systems made by TIRAvib with specification that appear to meet the

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LA-13131-M. Rev 1 Manual, *A Handbook for the Nuclear Suppliers Group Dual-Use Annex*, and ITAR Test and Production equipment restrictions.

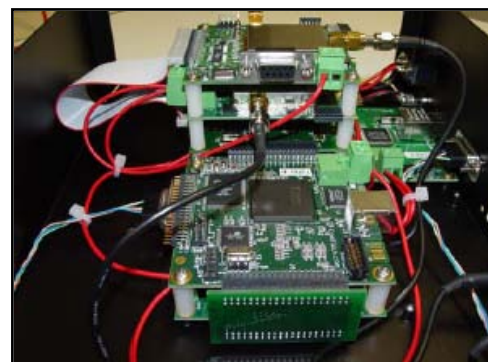
Additionally, other discrete items that are being sought have been included in this review. These items can be used for testing and building hardware and software that could be interfaced with the above described systems or other systems not yet identified for the end users.

**Conclusion:** Given the unique technical nature of the items reviewed, acquisition of these items would enhance the end users abilities to operate in a military battlefield environment, to develop RF communication systems and radar capabilities, and to develop and validate missile and nuclear weapon hardware. Due to the large number of multi-use interrelated items being sought, additional analysis is recommended to identify of potential technical applications.

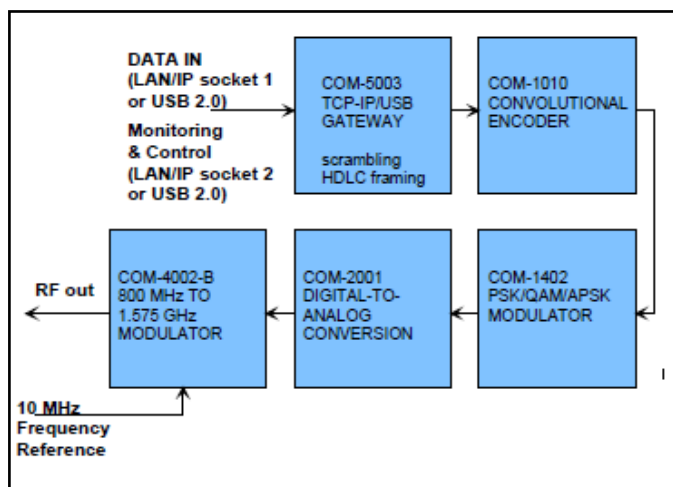
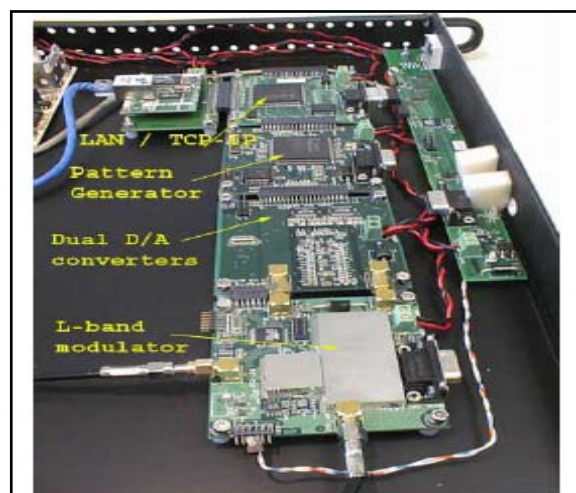
## ComBlock Background

The ComBlock architecture is aimed at rapid prototyping for the development of software-defined radios and building semi-custom equipment. The ComBlock family includes a variety of digital, analog and radio frequency modules that implement technology application for FPGAs (Floating Point Graphic Arrays), digital signal processors, ARM processors, modulation, demodulation, error correction encoding and decoding, encryption/decryption, digital to analog/RF, RF/analog to digital formatting, data storage and baseband interfaces capable of being interconnected for rapid system design and production. ComBlock offices are located in Gaithersburg, Maryland.

For maximum volume efficiency and simplified packaging by the end user, ComBlock modules can be assembled in two or three dimensional structures, as shown on the right, that can be individually packaged. Thus, by using the ComBlock family of modules it is possible to develop communication systems capable of transmitting and receiving voice, video, hi-speed digital data, wireless internet, internet TV, and satellite TV utilizing frequencies ranging up to 2.4 GHz.



However, these systems can also be designed to establish complex communication systems for the end user with the potential for signals intelligence gathering/disruption.



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ComBlock Variable Data Rate L-Band Transmitter and configuration diagram

## Software Defined Radio and Joint Tactical Radio System Background

Software Defined Radio (SDR) is a radio system that has the ability to be transformed through the use of software or redefinable logic for a variety of applications all originating from the same component modules. Quite often this is done with general-purpose digital signal processors (DSPs) or field programmable gate arrays (FPGAs).

Regardless of the means by which the radio is reconfigured, a fully implemented SDR has the ability to navigate a wide range of frequencies with programmable channel bandwidth, data rate, and modulation characteristics. Because of this wide ranging capability, the US Military has chosen to build its next generation wireless communication platform, Joint Tactical Radio System (JTARS) using SDR technology. JTARS accommodates voice, video and high-speed data in the 2 to 2000 MHz spectrum. Encryption is included in addition to other electronic enhancements to provide secure communications in a hostile battlefield environment for a host of different communication platforms. Such platforms include aircraft, ground vehicles, ships, and satellites that can be used for police, government or military applications.

Distinct advantages of the US JTARS system include:

- Software programmable
- Multi-band; multi-mode; multi-carrier; multi-rate and variable bandwidth as shown on the right.
- Backwards compatible with legacy systems
- Modular design
- Scaleable
- Flexible form factor
- Demand adaptive (Dynamic Bandwidth Management)
- Networked
- Secure
- Open system architecture



## Transaction Analysis

SDR development using ComBlock modules is suitable for wireless, satellite, and internet applications using complex digital signal transmissions. Transmitted media can include voice, video and high-speed data, as employed in internet traffic and internet TV. ComBlock products are utilized worldwide by systems integrators and have been shipped to over 42 countries. However, through customization of the modules it is possible to design systems with the intent of intelligence collection and disruption of the US Military systems.

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While many modules have been ordered with various functionalities, *it is expected that other orders will be placed in the future, or have occurred in the past seeking some of the more exotic modules from ComBlock's diverse product line.* If acquired these modules could enhance signal security and monitoring capabilities for the end users. Potential modules for future orders would most likely include cards from the complete product line. Additionally, card orders to monitor for by this end user could include encryption/decryption, bit interleaver/deinterleaver, spread spectrum, high speed data acquisition, signal diversity combiner/splitter, satellite link simulator, and FPGA/VHDL development platforms. The general product categories include:

- Modulators
- Demodulators/Modems
- Error Correction
- Baseband Interfaces
- Signal Generators/Test Modules
- FPGA/VHDL Development Platforms
- Scrambling/Stream Formatting
- Analog/IF/RF Front End

Much of the support hardware that is observed on the requested parts list would be applicable for interfacing the sought modules for input/output to discrete components. These discrete items are potentially suitable for RF applications such as radar, jammers, or cellular communication systems. Examples of these items follow and are representative of items observed on the transaction lists.

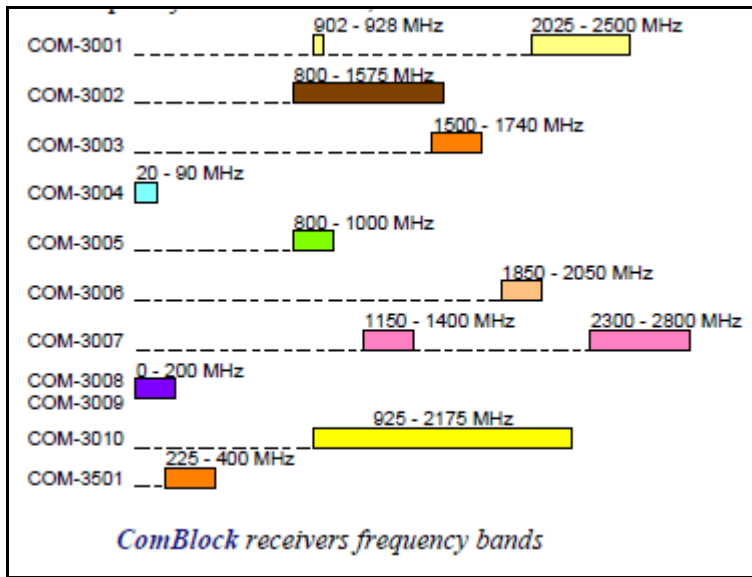
- Antennas
- RF mixers
- RF circulators
- RF filters
- Clock/crystal oscillators
- Pre-amplifiers and Amplifiers
- Switches
- Power Splitters
- Etc.

Identified RF receivers in the transaction list and their associated frequencies are shown below.

- COM-3001-B Dual Band Receiver, AGC, A/D Conversion [915MHz / 2.4 GHz]
- COM-3002-B L-Band Receiver Wideband [900-1575 MHz]
- COM-3003-B L-Band Receiver, AGC, A/D Converter [1500-1740 MHz]
- COM-3004-B IF Receiver, 12 MHZ Bandwidth [20-90 MHz].

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Identified RF transmitters/modulators in the transaction list include:

- COM-4003-d L-Band Modulator [1500-1740 MHz]
- Com-4007-D Dual Band Modulator [2.3-2.8 GHz / 1.15-1.4 GHz]
- COM-4101 Transmit Redundancy Module dual path [10MHz – 1.5GHz]
- COM-4102 Transmit/receive Module.

Identified Error Correction Modules in the transaction list include:

- COM-1010 Convolution Encoder
- COM-7001 Turbo Code Encoder/Decoder
- COM-1015 Viterbi Decoder
- COM-1006 Reed Solomon Encoder.

Identified Baseband Interfaces in the transaction list include:

- COM-5003 TCP-IP/USB Gateway
- COM-5101 Signal/Power Conditioning Interface Module.

Identified Signal Generators and Test Modules in the transaction list include:

- COM-1005 Bit Error Rate Measurement Module
- COM-1023 Bit Error Rate Generator
- COM-1024 Multi-Path Simulator (delay, Doppler, amplitude)

**ComBlock Corporation Summary** – The 17 modules, identified in the previous paragraphs, are suitable for the development of a Software Defined Radio communication system capable of transmitting and receiving voice, video, hi-speed digital data, wireless internet, and satellite signals including TV. ComBlock Corporation is located in Gaithersburg, Maryland.

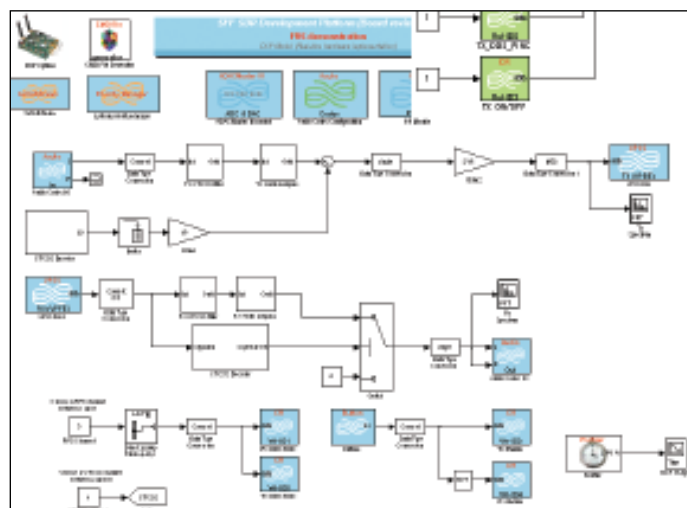
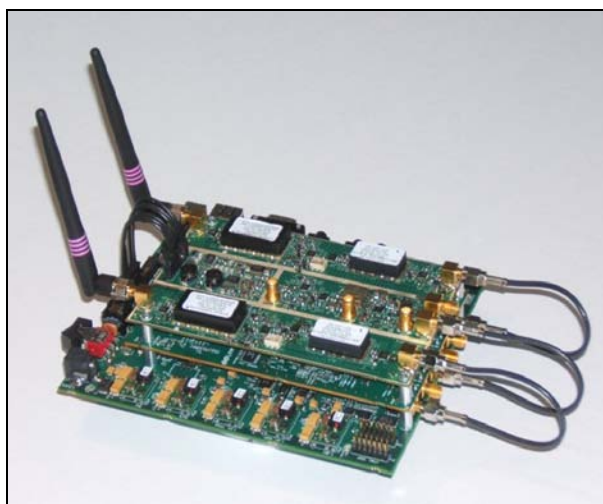
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## Lyrtech

A second SDR application request set focuses on Lyrtech's small form factor (SFF) software defined radio (SDR) development platform and the XILINX based Lyrtech Virtex-4 FPGA SDR Development Platform as observed on the black list. Inspection of the related reference sheets and websites indicates that these items are designed to address special SDR needs for the military, public safety, and commercial markets employing tactical handheld and mobile radios, and manpacks. Similar to the ComBlock modules, it is possible to achieve a fast time from prototype to production using this development platform that can be programmed via a Simulink model based graphical design environment by dragging and dropping icons. Lyrtech has offices worldwide and is also located Richardson, Texas.



## MITEQ

MITEQ (Microwave Information Transmission Equipment) orders were noted for four precision amplifiers on the black transaction list:

- JS4-06—1800-155-10A
- JS2-02000800-08-0A [2-8GHZ]
- JS4-26004000-27-8A [26-40 GHZ]
- JSD4-18002600-18-BA(8A).

MITEQ supplies both US military and commercial markets with microwave components and integrated assemblies, and satellite communications and earth station equipment. Per the MITEQ website, military applications include missile guidance, military electronic countermeasures, radar warning and surveillance systems, land, sea and airborne radar and air traffic control radar. Research and development applications are also suitable uses. MITEK is located in Long Island, New York.

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## ATDI

A group of items observed on the red and black transaction lists have the capability to enhance the end users ability to operate in a military battlefield environment. The items of interest are ATDI's HTZ Warfare, Hertz Mapper, ICS Manager and ICS Telecom. While Hertz Mapper is called out on the black transaction list, it is possible that ICS Maper Server was the actual intended item of interest. It would not be unexpected to see a future order for the Antios software module for antenna design. ATDI Inc. has a US Office in Mclean, VA.

ATDI's HTZ Warfare is identified on the company website as their "flagship RF network design and spectrum management software product that specializes in both pre-deployment and real-time simulation and analysis of military tactical communications." HTZ Warfare is a comprehensive tool box for modeling radio communications in the MF/HF/VHF/UHF/SHF/EHF frequency bands. HTZ warfare includes a built-in capability for dynamic modeling or '*Real Time Situational Awareness*'. The HTZ warfare interface allows the user to connect to message traffic updates of node movement at a transmit dependent rate that can average an upload time of 5 ms/update.

Per ATDI's website, HTZ warfare is considered the only commercial off-the-shelf Electronic Warfare/Attack modelling/training platform in the world. The tool offers dedicated features for modeling:

- direction finding
- jamming
- radar
- signal interception

## Infrastructure and tactical with HTZ warfare

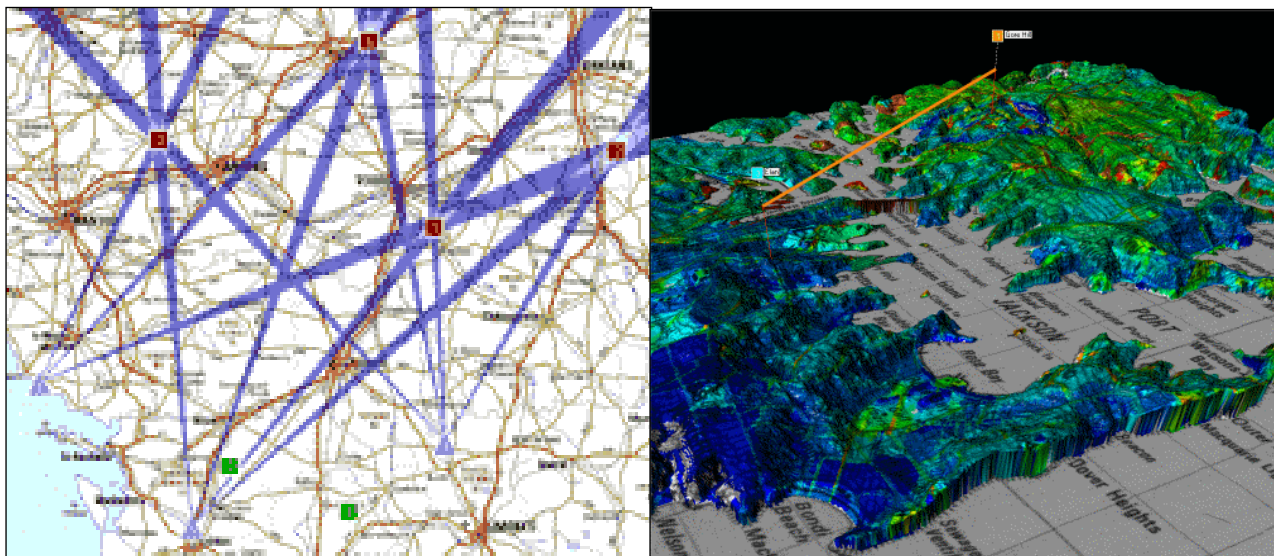
The HTZ warfare system can be used as a planning package for a wide range of scenarios. For tactical and infrastructure networks, HTZ warfare *nG*, when combined with the other modules being ordered, can provide the following capabilities as specified in the ATDI website (the list is only an indication of the main features):

- The ability to analyze operating terrain and to manipulate three dimensional images of the battlefield from any angle.
- The ability to examine links between communications assets and assess the performance of the link in detail. All simulations are based on proven, accurate simulation methods.
- The ability to move individual sites and analyze communications capability virtually instantly.
- The ability to assess the impact of communication site failure on the overall network so that contingency planning can be included as part of the normal system design process.
- The ability to quickly assess the risk of interception or jamming by known enemy electronic warfare assets.
- The ability to identify network capabilities for moving elements such as convoys moving through hostile territory. Suitable locations for talk-through sites can be quickly identified.
- The ability to analyze operating terrain and to manipulate 3D images of the battlefield from any angle.
- The ability to design complete communications networks, including the ability to minimize interference, assign frequencies and generate alternate communications plans.

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- The electronic warfare aspects of communications planning can also be included by analyzing intercept vulnerability, identifying the possible effects of enemy jamming and developing plans to overcome these factors.
- "Quick look" analyses which allow the planner to change any aspect of a network and view the effect virtually instantaneously. This includes the ability to quickly assess the effect of failure or enemy action on the network. This helps planning for survivability.
- The ability to plan for the deployment of intercept receivers, including intercept coverage assessment and gap identification, maximizing the efficiency of deployed sensors or minimization of assets assigned to a given objective, planning communications between intercept units and central analysis cells and providing the planner with the tools required to plan an evolving network which can move with the operation.
- The tools needed to plan direction finder deployments, with best site searching, DF baseline coverage assessment and communications planning between assets. The system can be integrated with DF systems so that DF hits can be displayed directly on the planner's screen.
- Tools for the planning of offensive communications jamming missions, including asset optimization, communications planning and assessments of jamming effects on own communications systems.
- The ability to determine the vulnerable points in known enemy communications systems, and to prioritize targets for attack.



## Vibration System

The ordered parts from TIRAvib, Vibpilot and ICP are suitable for building an electrodynamic vibration test system that can provide sinusoidal, random, or shock vibrations, and can operate over a wide range of frequencies. Such a system can be used to qualify parts to Mil-Spec standards and to validate their operation in harsh operating environments as found in space flight, military applications and industrial environments. The vibrations systems and associated hardware include:

1. TIRAvib TV 59349/AIT-440 (50kN) electromagnetic vibration test system.
2. TIRAvib TV59389/AIT-440-70K (70kN) electromagnetic vibration test system.
3. TIRAvib TGT MO39 XXL(991mm x 991mm, 50mm thickness) mounting table (80.5 kg).
4. Vibpilot VP4-004 Digital Vibration Control & Analysis System (4 input/2 output ch.).
5. ICP Accelerometer Model 352C03.

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The TIRAvib shakers have the capacity to impart 50 kN (kilo-newtons) and 70 kN of force with a 0-3 KHz (kilo-hertz) of vibration frequency range. The controller has a user friendly software front end capable of performing vibration sweeping or stationary vibration delivery from 1 Hz to 12.8 KHz, and shock generation as well. The ICP accelerometers have a 0-500G range with sensitivity of 10 millivolts/G. This gee range translates to 0.2% of full scale that exceeds the ITAR 0.25% limit. Likewise, the ITAR force limit is 50 kN and 5kHz is the bandwidth limit.

Tira Vibration test systems are manufactured by TIRAvib, which is headquartered in Shalkau, Germany with worldwide offices. Vibpilot is manufactured by MPI International and has a US office in Verona, New Jersey. ICP accelerometers are manufactured by PCB Piezotronics Inc. that is located in Depew, New York. The vibration systems are

**ETS-Lindgren** - extra high performance microwave pyramidal absorbers, ultra broadband microwave absorbers, multi-line low pass filter networks for conducted emissions measurement, and test cells for performing radiated emissions and radiated immunity test. Applications include telecommunication/wireless, satellite, high-speed electronics, automotive and military. ETS-Lindgren is located in Cedar Park, Texas a part of the Western District of Texas.



**Empower RF Systems, Inc.** - solid state broadband high power amplifier rated at 20-500 MHz operating frequency and 500 Watts output power. This amplifier is suitable for RF, VHF and UHF high power linear applications. Empower RF Systems, Inc. is located in Inglewood, California.

**RJE International Inc.** - ULB-362-PL Underwater Location Beacon with Power Loss Activation. This beacon is suitable for locating submerged items for retrieval. RJE International Inc. is located in Irvine, Ca.

**Agilent Technologies Inc.** - High Performance Portable Spectrum Analyzers: 8565E (9 KHz to 50 GHz), 8564EC (9 KHz to 40 GHz) and 8563E (30Hz to 26.5 GHz). This analyzer is suitable for RF frequency and power analysis of emitted signal of interest. Agilent Headquarters (a Hewlett Packard spin-off company for scientific instrumentation) is located in Santa Clara, California.

**Panasonic** - Toughbook 30 Ruggedized Laptop with gobi mobile broadband technology from Qualcomm. The Toughbook 30 has global cellular connectivity through high-speed 3G mobile internet networks. Panasonic Computer Solutions Company's corporate office is located in Secaucus, New Jersey.

**Radisys Corporation** - Microware HAWK Development Suite with the OS-9 real-time operating system for embedded system programming applications. RadiSys' world headquarters is located in Hillsboro, Oregon.

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**Teseq Inc. (formerly Schaffner Test Systems)** - GTEM 1250 and GTEM 250 Test Cells for measuring the electromagnetic radiation from integrated circuits via a connected spectrum analyzer (e.g. GTEM 250: dc to 18 GHz). Teseq USA offices are located in Edison, New Jersey.

**Greenray Industries, Inc.** - Ultra-low phase noise precision crystal oscillators model numbers YH1320-N28-UL-25MHz (Squarewave output with pins on side), YH1321-N28-UL-10 MHz (Sinewave output with pins on side), and YH1322-N28-UL-10 MHz (Sinewave output with pins on side). These oscillators are used in many military and aerospace applications including wireless communications, GPS, STACOM, and Instrumentation applications. Greenray Industries, Inc. located in Mechanicsburg, Pennsylvania.

**NavSync GPS Technologies** - CW25-ULS GPS Receiver Module with embedded ARM 966E-S processor. Used for tracking and maintaining positional fixes in extremely weak signal areas. NavSync GPS Technologies US offices are located in Aurora, Illinois.

**OMNIYIG Inc.** - OLP240A Pin Diode Limiter in a hermetic module. This protective device limits the input power to other sensitive electronic devices which can be damaged by power spikes. These devices are manufactured by a company associated with developing electronic warfare and electronic countermeasures applications for the US Military. OMNIYIG is located in Santa Clara, California.

**Hittite Microwave Corporation** - HMC 547 LP3 GeAs MMIC SPDT non-reflective switch that operates in the DC-20GHz region. These switches are suitable for base station infrastructure, telecommunication, microwave radios, radar, electronic counter measures and test instrumentation. Hittite headquarters are located in Chelmsford, MA with other offices and sites in various countries.

**Temex FTF-REF 17** Military Crystal Filter with center frequency at 50 MHz and bandwidth 36 KHz at 3dB. These high precision high reliability crystal filters are suitable for defense and space applications, radio-receivers, transponders, radars and missiles. Temex headquarters are located in Mougins, France with representative in various countries.

**Poynting Antennas** - LPDA-0036 directional wideband (20-3000 MHz) tactical antenna used for wideband monitoring and jamming applications. The LPDA-0060 high power directional antenna (30-400 MHz operating region) is primarily designed for electronic warfare operations. Poynting Antennas has corporate offices in Gauteng, South Africa and two US distributors for interfacing with defense contractors.

**Lucix Corporation** – LO-134-FB (13.161-14.540 GHz) and LO-086-FB (8.390-8.819 GHz) Dielectric Resonator Oscillators (DROs). Lucix manufactures converters, DROs, Amplifiers and Power Amplifiers for the commercial, military and space satellite applications. Lucix is located in Camarillo, California.

## **Summary**

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While many end use SDR applications exist for both government and commercial entities, the requested transaction transmitter and receiver frequencies of interest can provide insight into potential applications. Of significance is establishment of enhanced capabilities for voice, video and hi-speed data from remote locations through land, wireless and satellite links in the end use country of interest.

Commercial applications are possible, but it would probably be more economical to purchase commercial-off-the-shelf items that are custom designed to provide satellite TV, phone and internet service in a ready to go condition that requires minimal development effort. Alternatively, commercial vendors sell products and services that could be contracted for use in the end use country of interest.

It is my opinion that the potential SDR system and some of the discreet items end use applications could be targeted for government, military, scientific, or university customers. However, with the additional information presented in the second black transaction list, I have high confidence these items are for a military application after observed orders for ADTI's HTZ Warfare, ICS Telecom, ICS Manager and Hertz Mapper. With adequate engineering development time the end users war fighting abilities can be significantly enhanced.

Analysis of supplemental provided information by DHS/ICE on the vibration test system indicates that ITAR and Dual-Use Annex (LA-13131-M Rev. 1) criteria are met. After final vetting of this analysis, it is probable that this system would be suitable for component testing of missile hardware and nuclear explosive device systems, including arming fuzing and safing systems. Alternatively, this system could also be used to test ruggedized communications hardware developed from the components in this analysis.

This summary will continue to expand in depth, as more information becomes available. Clarification of particular module functions, discreet components, and other SDR and ATDI configurations will be provided on a later update. For further question, I can be contacted via phone or email.

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Formerly Detailed to:

FBI - Headquarters  
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CBRN Weapons Tradecraft and Tactics Unit

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